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HUMAN HEALTH RESEARCH PROGRAM

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RESEARCH CONTRIBUTES TO CUMULATIVE RISK ASSESSMENTS FOR ORGANOPHOSPHATES

Issue:

Organophosphates are pesticides used in agriculture and non-agriculture settings that affect functioning of the human nervous system through inhibition of a specific enzyme. They are among the U.S. Environmental Protection Agency's first priority group of pesticides to be reviewed under the Food Quality Protection Act (FQPA) of 1996. The act mandated a re-evaluation of tolerances for pesticides by 2006, in consideration of the human health effects that result from exposure to two or more chemicals that act in a similar fashion. The Agency was able to meet the requirements of that mandate by developing and conducting a complex assessment of cumulative exposure and risk to human health from these pesticides.

Science Objective:

EPA scientists in the Office of Research and Development developed a more thorough examination of risk associated with commonly used pesticides. Since the routinely used organophosphates all have a similar mode of action, which is to say they all inhibit the enzyme acetylcholine esterase [AChE], they were selected for the first cumulative risk assessment conducted

by EPA. This assessment evaluates the potential for people to be exposed to more than one organophosphate at a time and considers exposures from food, drinking water, and residential sources. In addition, this evaluation considers a full set of reliable assessments of toxicity to characterize the potential risk of cumulative exposure to organophosphates.

Several aspects of this assessment represent an advance on previous practice, leading to a far more comprehensive and accurate method of assessing exposure to similar-acting pesticides. The prevailing practice has been to select a single experiment with which to characterize potency; in this study all reliable experiments were used. This gives a more robust estimate of potency and allows a more refined look at the relationship between dose and effect.

Application and Impact:

This research program has reduced uncertainty in risk assessment in several significant ways. First, it has demonstrated the usefulness of ORD methods, tools, and data, as well as an innovative approach for conducting cumulative risk assessments under the FQPA mandates. The research program also

has improved understanding of exposure scenarios, key risk factors, and biological mechanisms that point to the usefulness of additional safety factors when analyzing whether pesticide usage poses health risks to susceptible populations. From that knowledge, several organophosphates that previously had been in use have since had their availability canceled or curtailed.

The program also has served to provide a basis for assessing risks from other classes of pesticides that come under the FQPA mandate. This broad new framework can be considered by Agency risk assessors when addressing cumulative risks to other classes of compounds and mixtures.

REFERENCES:

Setzer, W.; et al. Research Supporting the Relative Potency Factor Assessment of OP Pesticides, Poster LTG 2-12 for BOSC Review. April 25, 2005.

U.S. Environmental Protection Agency Web site, www.epa.gov/pesticides/cumulative/rra-op/, Organophosphate Pesticides: Revised Cumulative Risk Assessment. June 2002.

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